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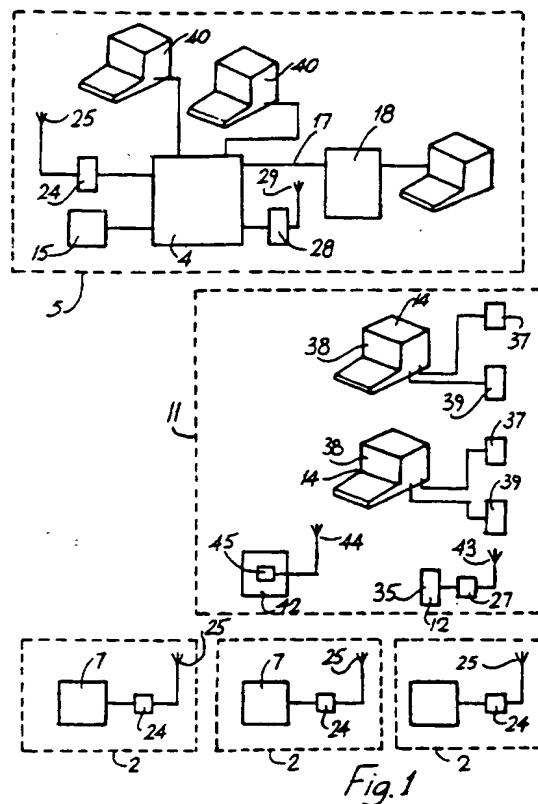
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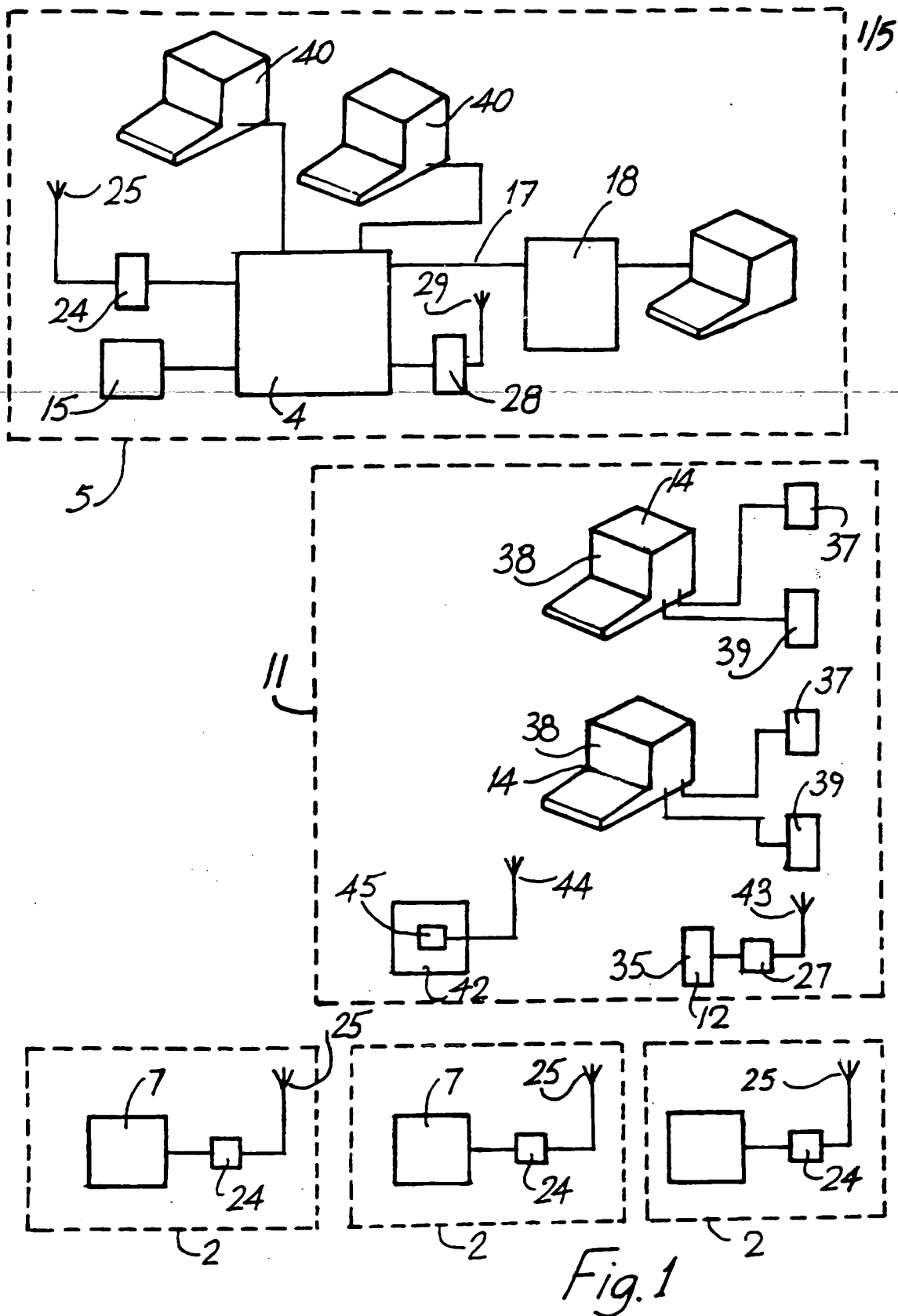
(58) Field of Search

**UK CL (Edition O) G4H HNEC HNEE HNP
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(54) Apparatus for controlling and tracking the transfer of a plurality of containers

(57) Apparatus for controlling and tracking the transfer of a plurality of containers by delivery vehicles from a plurality of pick-up locations to a plurality of set-down locations comprises a central computer (4) which is in radio communication with a plurality of remote units (7) in the respective delivery vehicles (2). As the containers are being picked up and set down they are scanned into and out of the delivery vehicles (2) using a first infrared bar code scanner. Details of the containers being picked up and set down are stored in a central memory (15) which is continuously updated as containers are being picked up and set down by the delivery vehicles (2). Some of the containers may temporarily be retained in intermediate storage in a vault (11), and as the containers are transferred into and transferred out of the vault (11) they are also scanned and the details of the respective containers is relayed to the central computer (4) for storing in the memory (15). The central computer sends time and location pick up and set down schedules to the remote units (7).





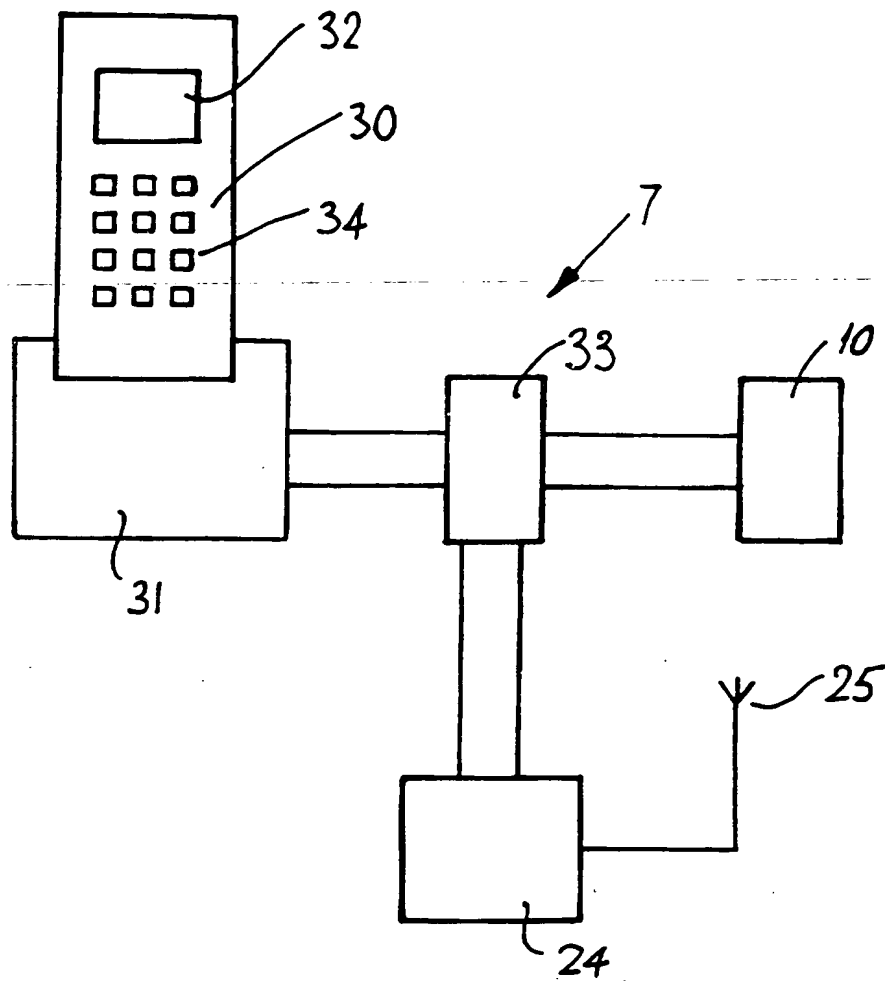


Fig. 2

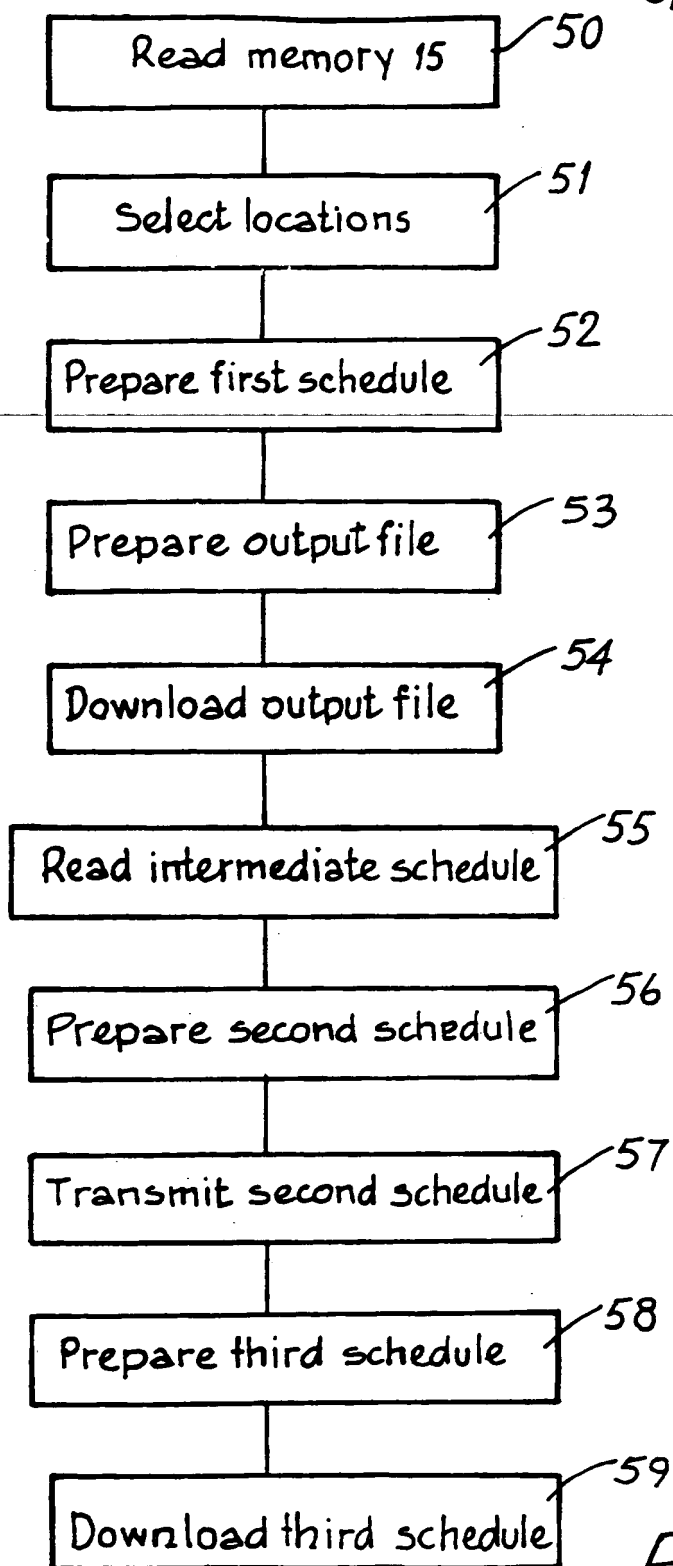


Fig.3

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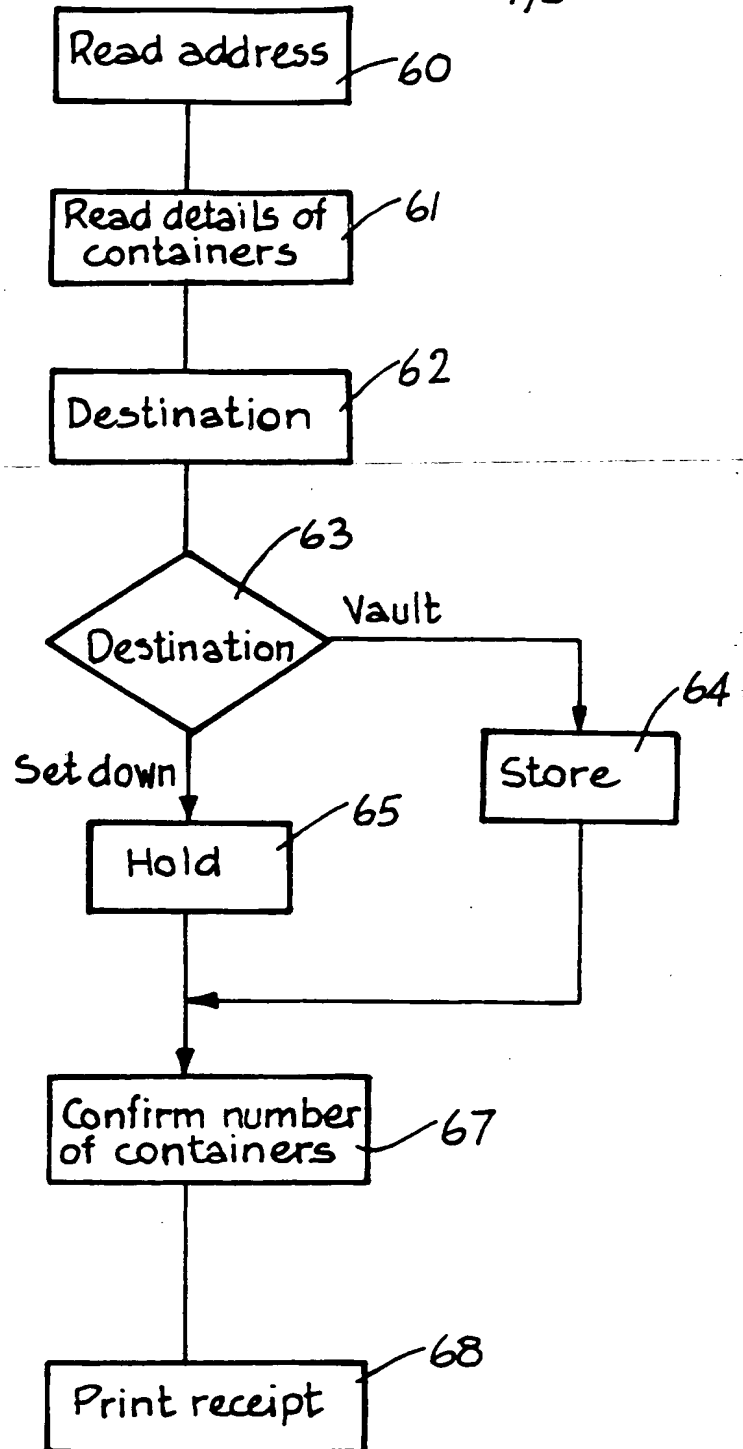


Fig.4

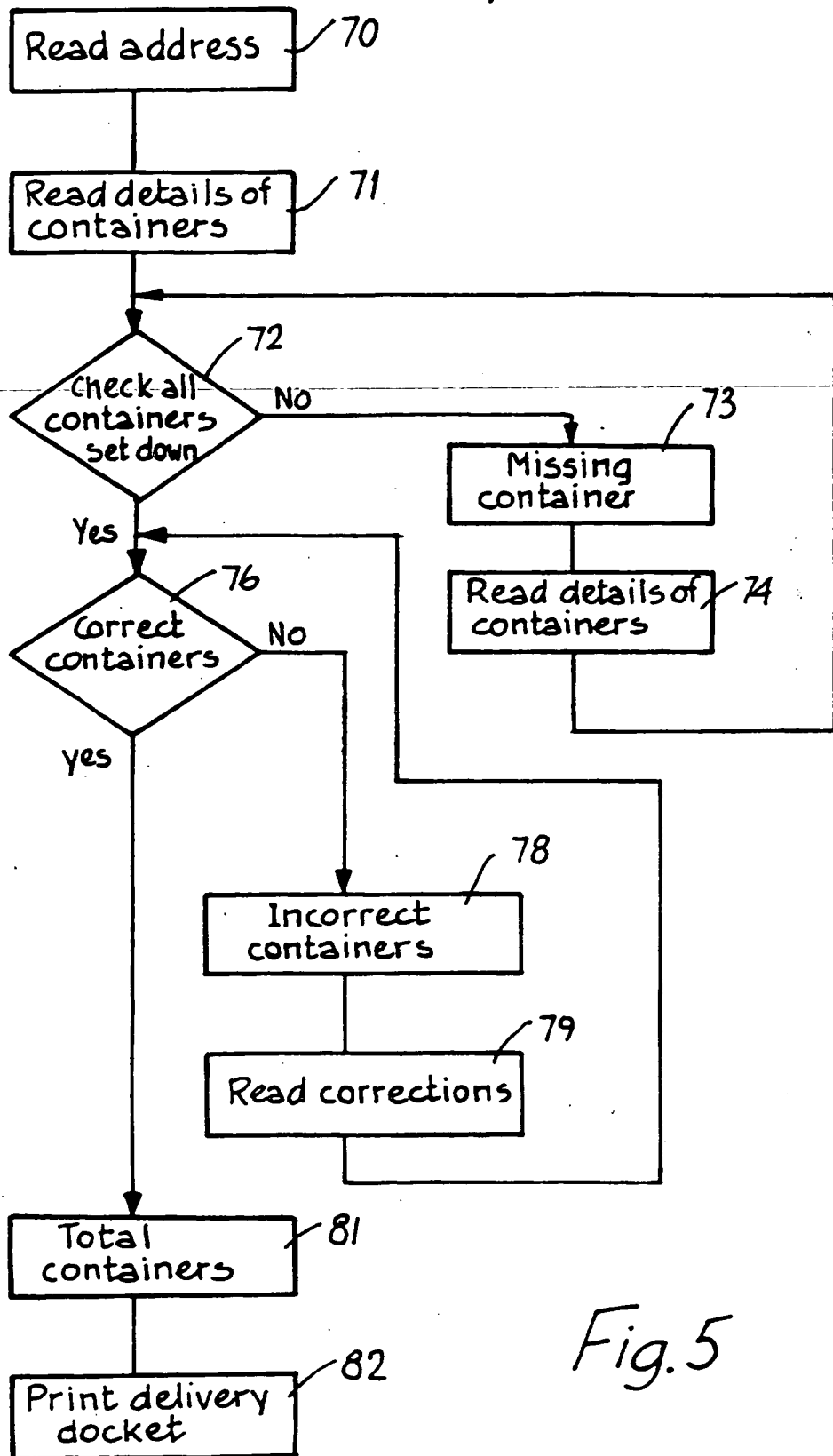


Fig.5

"Apparatus for controlling and tracking the transfer
of a plurality of containers"

The present invention relates to apparatus for
controlling and tracking the transfer of a plurality of
5 containers by delivery vehicles from a plurality of
pick-up locations to a plurality of set-down locations.

In the transfer of containers from pick-up locations to
set-down locations by delivery vehicles, in many cases,
it is important that the transfer of the containers
10 should be tracked during the transfer operation. It is
also particularly important to optimise the usage of
the delivery vehicles in the transfer of containers.
This requires the preparation of a schedule of
containers to be picked up and set down by the
15 respective delivery vehicles, and this schedule in
general, is prepared using a suitable mathematical
model. The tracking and verifying of the pick up and
set down of containers by delivery vehicles is
particularly important in the case of the transfer of
20 important documents, funds and the like.

Computer programmes for preparing schedules of
containers and the respective delivery vehicles which
are to pick up and set down the containers for
optimising the usage of the delivery vehicles using

such mathematical models are known. However, while computer programmes for carrying out the scheduling of the containers with respective delivery vehicles are known, there is no suitable method or apparatus for confirming and tracking the transfer of containers as they are being transferred which allows current central monitoring of the pick up and set down of the respective containers. In general, known methods and apparatus for confirming and tracking the transfer of containers, in general, are based on manual paper systems whereby the crew in the delivery vehicle which is making the pick up or set down manually prepares a delivery docket or a receipt, and copies of these documents are handed over to a central control station at the end of a day or at the end of a delivery run by the crew of the delivery vehicle. In general, this is the first confirmation that the central control station has of deliveries and pick-ups.

There is therefore a need for an apparatus for controlling and tracking the transfer of a plurality of containers by a plurality of delivery vehicles from a plurality of pick-up locations to a plurality of set-down locations which overcomes the problems of known methods and apparatus.

The present invention is directed towards providing

such apparatus.

According to the invention there is provided apparatus for controlling and tracking transfer of a plurality of containers by delivery vehicles from a plurality of
5 pick-up locations to a plurality of set-down locations, the apparatus comprising

a central controller,

a plurality of first remote units located in the respective delivery vehicle,

10 a first communicating means for communicating the central controller with the respective first remote units;

the central controller comprising

a first storing means for storing a plurality of
15 addresses of respective pick-up locations and set-down locations, details of containers to be picked up and set down and the respective pick-up and set-down locations of the containers, and the times at which pick ups are to be made,

20 a first compiling means for preparing from the data stored in the first storing means a first schedule of addresses of locations at which containers are to be picked up and/or set down during a predetermined period of time, and the time of pick up,

25 a second compiling means for preparing from the first schedule a plurality of second schedules of the

addresses of the locations at which the containers are to be picked up and/or set down by the respective delivery vehicles during the predetermined period of time and the respective times of pick up,

5 a second storing means for storing details of all containers picked up and set down by the respective delivery vehicles,

 a first output means for outputting via the first communicating means the second schedules to the
10 respective first remote units of the corresponding delivery vehicles, and

 a first receiving means for receiving details from the respective first remote units via the first communicating means details of containers being picked
15 up and set down by the respective delivery vehicles;

 each first remote unit comprising

 a first reading means for reading details of each container picked up and set down by the corresponding delivery vehicle,

20 a first output means for outputting to the first receiving means of the central controller via the first communicating means details of containers picked up and set down by the corresponding delivery vehicle from the first reading means,

25 a first receiving means for receiving data from the first output means of the central controller via the first communicating means,

a display means for displaying data received from the central controller relating to the containers,

a means for confirming to the central controller the correctness of the data received and displayed on the display means,

a first printing means for printing a docket in connection with each container received and/or delivered for issuance to a person to who or from who a container has been picked up or set down.

10 Preferably, provision is made for temporarily holding some of the containers in an intermediate storing location between the respective pick-up and set-down locations of those containers, the apparatus comprising a second remote unit which comprises

15 a second reading means for reading the details of each container transferred into and out of the intermediate storage location,

a second communicating means for communicating the second remote unit with the central controller,

20 a second output means on the second remote unit for outputting data read by the second reading means to the central controller via the second communicating means, and

a second receiving means for receiving data from
25 the central controller via the second communicating means.

In one aspect of the invention each second reading means comprises a bar code reader.

In another aspect of the invention the second storing means stores details of containers stored in the
5 intermediate storage location.

Ideally, the first compiling means compiles a third schedule for communicating to the second remote unit, the third schedule comprising details of the containers in the intermediate storage location to be transferred
10 to the respective delivery vehicles for subsequent set down during the predetermined period of time together with details of the delivery vehicle to which each container is to be transferred.

In another aspect of the invention each second remote
15 unit comprises a second printing means for printing the third schedule.

Preferably, the first schedule is prepared from data stored in the first and second storing means.

In one aspect of the invention each first reading means
20 comprises a bar code reader.

Preferably, the first and second communicating means

are radio communicating means.

Advantageously, each output means comprises a radio transmitter, and each receiving means comprises a radio receiver.

5 In one aspect of the invention the central controller comprises a central computer. In another aspect of the invention the first and second storing means comprise disc storing means.

10 Ideally, the first compiling means is implemented in the central computer in software, and advantageously, the second compiling means is implemented in software in the central computer.

In one aspect of the invention the second compiling means compiles the second schedules from an
15 intermediate schedule which is prepared in a secondary computer from the first schedule, a third communicating means being provided between the central computer and the secondary computer for communicating the first, the intermediate and the second schedules between the two
20 computers, the intermediate schedule being prepared using a mathematical model for scheduling the delivery vehicles and the addresses of the locations at which pick-ups and set-downs are to be made.

In another aspect of the invention the first printing means of each first remote unit is controlled by the first remote unit in response to the central controller.

- 5 In a further aspect of the invention the first printing means comprises a printer.

Additionally, the invention provides a container transferred from a pick-up location to a set-down location and tracked between the pick-up and set-down
10 locations using the apparatus according to the invention.

The invention will be more clearly understood from the following description of a preferred embodiment thereof which is given by way of example only, with reference
15 to the accompanying drawings, in which:

Fig. 1 is a block representation of apparatus according to the invention for controlling and tracking the transfer of a plurality of containers by delivery vehicles from a plurality of pick-up
20 locations to a plurality of set-down locations,

Fig. 2 is a block representation of a portion of the apparatus of Fig. 1,

Fig. 3 illustrates a flow chart of a sub-routine of a computer programme for controlling the apparatus of Fig. 1,

5 Fig. 4 illustrates a flow chart of another sub-routine of the computer programme for controlling the apparatus of Fig. 1, and

Fig. 5 illustrates a flow chart of another sub-routine of the computer programme for controlling the apparatus of Fig. 1.

10 Referring to the drawings and initially to Figs. 1 and 2 there is illustrated apparatus according to the invention indicated generally by the reference numeral 1 for controlling and tracking the transfer of a plurality of containers (not shown) by delivery
15 vehicles, which are indicated in block representation by broken lines 2 from a plurality of pick-up locations to a plurality of set-down locations. Although only three delivery vehicles 2 are illustrated in block representation in Fig. 1, it will be appreciated that
20 many more vehicles 2 in general will be provided. Typically, the apparatus 1 may be used for the transfer of funds, which may be transferred in cash, cheques or credit cards dockets, and other valuable documents between pick-up and set-down locations. The apparatus

1 comprises a central controller which comprises a
central computer 4 which is located in a central
control station indicated by the broken lines 5. Each
vehicle 2 is provided with a first remote unit 7 for
5 tracking the pick up and set down of the containers as
they are being picked up and set down by the respective
vehicles 2. A first communicating means in this case
provided by radio communication is provided between the
central computer 4 and the respective first remote
10 units 7 so that details of containers being picked up
and set down can be transmitted by the first remote
units 7 to the central computer 4 as the containers are
being picked up and set down or shortly thereafter.
The radio communication link is described in more
15 detail below. Each first remote unit 7 is provided
with a first printing means, namely, a first printer 10
which is located in the corresponding vehicle 2 for
printing out a schedule of all containers to be picked
up and set down by the respective vehicles 2, as will
20 be described in more detail below during a
predetermined period of time, typically one day or half
a day.

In certain cases, it is desirable that some of the
containers which are picked up by the vehicles 2 are
25 temporarily stored in an intermediate storing location,
in this case a vault between pick-up and set-down.

Typically, the containers may be stored overnight in a vault. The vault is illustrated in block representation in Fig. 1 by the broken lines 11. Typically, the vault 11 would be adjacent the central control station 5. A plurality of second remote units 12 are located in the vault 11 for tracking the transfer into and the transfer out of the vault 11 of containers from and into the delivery vehicles 2 as will be described below. Only one second remote unit 12 is illustrated in Fig. 1. A second communicating means for communicating the central computer 4 with the second remote units 12 comprises a radio link as will be described below. Two third remote units 14 also for tracking the transfer into and out of the vault 11 of the containers from and into the vehicles 2 are also provided in the vault 11 which are hard wired to the central computer 4.

Turning now to the central computer 4, the central computer 4 comprises first and second storing means, namely, a suitable permanent storage medium, typically, a hard disc memory 15 for storing a plurality of addresses of the pick-up and set-down locations at which containers are to be picked up and set down. The memory 15 also stores the times and dates or days of the week at which the containers are to be picked up. Typically, a time frame of one hour would be stored

within which a container may be picked from a pick-up location. Times, and typically time frames at which the containers are to be set down at the respective remote locations may also be stored in the memory 15.

5 The type of containers and their respective contents may also be stored in the memory 15. A description of the type of funds contained in containers may also but not necessarily be stored in the memory 15. The current location of containers in transit between their
10 respective pick-up and set-down locations is also stored in the memory 15, for example, if a container is in the vault 11 or in a delivery vehicle and the identity of the delivery vehicle would be stored in the memory 15.

15 A computer programme, sub-routines of which are described below controls the operation of the central computer 4, and under the control of the computer programme, a first schedule of the addresses of all the locations at which containers are to be picked up and
20 set down during a predetermined time period, typically, during a working day or a half-day is prepared by the computer 4 from the data stored in the memory 15. This first schedule is then transferred through a third communicating means, namely, a communicating link 17 to
25 a secondary computer 18 which operates under the control of a computer programme and which prepares an

intermediate schedule for scheduling the locations at which containers are to be picked up and set down with the respective delivery vehicles 2 for optimising the usage of the vehicles 2. Such computer programmes will be well known to those skilled in the art, and it is not intended to describe this computer programme in further detail. The intermediate schedule prepared by the secondary computer 18 is downloaded to the central computer 4 through the link 17. The central computer 4 prepares a plurality of second schedules from the intermediate schedule. One second schedule is prepared for each vehicle 2 setting out details of the addresses of the locations at which containers are to be picked up and set down and their respective pick-up and set-down locations and times. The second schedules are communicated to the remote units 7 of the respective vehicles 2, so that each vehicle 2 has a second schedule showing the pick-up and set-down locations at which containers are to be picked up and set down during the predetermined time period by that vehicle 2.

Communication between the central computer 4 and each first remote unit 7 as already discussed is by radio communication, in this case, frequency modulated (FM) radio signalling through a first communicating means. The first communicating means comprises a plurality of first FM transmitter/receivers 24 associated with the

central computer 4 and each first remote unit 7.

Aerials 25 are connected to the respective first transmitter/receivers 24 for transmission and reception of the FM signals which carry data between the central computer 4 and the first remote units 7. Second communicating means for communicating between the central computer 4 and the second remote units 12 which in this case is by short wave radio communication comprises a second short wave transmitter/receiver 28 associated with the central computer 4. An aerial 29 is provided for receiving and transmitting the signals between the second transmitter/receiver 28 of the central control station and the second remote units 12.

Turning now to the first remote units 7 and referring in particular to Fig. 2, each first remote unit 7 comprises a first reading means, namely, a portable hand held first infrared bar code scanner 30 for reading bar codes on the containers as they are being picked up or set down. Cradles 31 located in the vehicles 2 receive the first bar code scanners 30 through which data is downloaded and sent to the first associated transmitter/receiver 24 for transmission to the central computer 4 or to the first printer 10 through a switch 33. The switch 33 is an intelligent switch and switches between the printer 10 and first transmitter/receiver 24 and the cradle 31 in response

to a coded signal preceding the data being outputted from the cradle 31 or from the transmitter/receiver 24 to the switch 33. As soon as a pick up or set down has been completed, the relevant first scanner 30 is
5 returned to its associated cradle 31 and full details which have been scanned into the first scanner 30 of the containers which have been picked up or set down as the case may be are immediately transmitted to the central computer 4 through the cradle 31 and the first
10 transmitter/receiver 24. Each first scanner 30 is provided with a display screen 32 and a keypad 34 for facilitating communication between the delivery vehicle 2 and the central computer 4.

Turning now to the vault 11 the second remote units 12
15 each comprises a second reading means, namely, a second hand held infrared bar code scanner 35 for reading bar codes of containers as they are being transferred into or out of the vault 11. The second scanners 35 comprise respective on-board second short wave
20 transmitter/receivers 27 which are built into the scanners 35. A base station 42 in the vault 11 which comprises a transmitter/receiver 45 receives and transmits signals between itself and the respective hand held second scanners 35, which are in turn,
25 relayed by the base station 42 between itself and the transmitter/receiver 28 of the central station 5. An

inbuilt aerial 43 in each hand held second scanner 35 and an aerial 44 of the base station transmits and receives signals between the transmitter/receivers 27 and the transmitter/receiver 45. The aerial 44 of the base station 42 also transmits and receives signals between the transmitter/receiver 45 of the base station 42 and the second transmitter/receiver 28 of the central station 5. Thus, the second scanners 35 give an instant transmission of the details of containers being scanned by the scanners 35 to the central computer 4. Thus, as containers are being transferred into or out of the vault 11 to or from a vehicle 2, the details of each container are simultaneously transmitted to the central computer 4. Two insitu third infrared scanners 37 are also located in the vault 11 for reading details of containers being transferred into and out of the vault 11. The third scanners 37 are hard wired to the computer 4 through personal computers 38. A second printing means, namely, second printers 39 are also hard wired to the central computer 4 through the personal computers 38 for printing out third schedules of containers which are located in the vault 11 and which are to be transferred from the vault 11 to respective delivery vehicles 2 for subsequent delivery to their set-down locations. The third schedules are prepared by the central computer 4 and show the identity of the

containers and the corresponding vehicle 2 to which each container is to be transferred.

Personal computers 40 are hard wired into the central computer 4 for enabling updating of the list of
5 containers, their pick-up and set-down locations stored in the memory 15, as well as other relevant data pertaining to details of existing containers and new containers which are to be entered into the memory 15.

Turning now to Figs. 3 to 5 flow charts of sub-routines
10 of the computer programme which controls the operation of the central computer 4 will now be described. On a daily basis the central computer 4 prepares the first schedule of all containers which are to be picked up and/or set down at respective pick-up and set-down
15 locations by the delivery vehicles 2. The sub-routine of Fig. 3 prepares the first schedule as follows. Block 50 reads details which are stored in the memory 15 of all locations at which containers are to be picked up and set down, and the sub-routine then moves
20 to block 51 which selects details of all locations at which containers are to be picked up or set down during the particular day. The sub-routine then moves to block 52, which prepares the first schedule listing all locations at which containers are to be picked up and
25 set down during the day, the addresses of the pick up

locations and set down locations and the times which the containers are to be picked up and/or set down. Where containers have already been picked up from a pick-up location and are stored in the vault 11, this data will have been obtained from the details of the relevant containers in the memory 15, and where such containers are to be delivered to their set down locations on the particular day for which the schedule is being prepared, details of these locations and the containers and the fact that they are to be picked up from the vault 11 will be included in the first schedule. The sub-routine then moves to block 53 which prepares an output file for downloading to the secondary computer 18. The sub-routine moves to block 54 which downloads the output file to the secondary computer 18 and moves to block 55. The secondary computer 18 prepares the intermediate schedule setting out details of all the addresses of the locations at which containers are to be picked up and set down and the times of pick up and set down, and the delivery vehicles 2 which are to pick up and set down the respective containers. Block 55 of the sub-routine of the central computer 4 reads the intermediate schedule from the secondary computer 18 and moves to block 56. Block 56 prepares the second schedules for each delivery vehicle 2 which contains details of all the addresses of locations at which containers are to be

picked up and set down by the respective vehicles 2 and the times of pick up and set down for the container at each location. The sub-routine then moves to block 57 which transmits the respective second schedules to the
5 first remote units 7 in the respective delivery vehicles 2. The second schedules are stored in the first infrared scanners 30 in the vehicles 2 and are subsequently printed out in the corresponding first printers 10 for use by the crews of the delivery
10 vehicles 2. The crew of each delivery vehicle 2 can call up the location of the next containers to be picked up or set down for display on the display screen 32.

The sub-routine then moves to block 58 which prepares
15 the third schedule which gives details of the containers which are located in the vault 11 and which are to be transferred to delivery vehicles for delivery that day to their respective set down locations. The delivery vehicles to which each container is to be
20 transferred is cross-referenced against the details of the container. The sub-routine then moves to block 59 which downloads the third schedule to the second printers 37 in the vault 11 for facilitating preparation of batches of containers to be transferred
25 to the relevant delivery vehicles 2.

During loading of the containers from the vault 11 into the respective delivery vehicles 2, each container is checked out from the vault by either the second or third infrared bar code scanners 35 or 37. The
5 containers are then checked into the relevant delivery vehicle 2 by the first infrared bar code scanner 30 of the relevant first remote unit 7. The scanned data of each container checked into the delivery vehicles 2 is transmitted from the first remote unit 7 to the central
10 computer 4 for updating of the memory 15. Similarly, the details of the container scanned by the second and third remote bar code scanners is also relayed to the central computer 4 for cross checking.

Turning now to Fig. 4 the sub-routine of the computer
15 programme of the central computer 4 for controlling and tracking pick up and set down of containers will now be described. Block 60 requests the crew in the delivery vehicle to identify the address of the location at which they have arrived and reads the address entered
20 through the keypad 34 of the relevant first remote unit 7. Details of the containers being picked up at the location are scanned by the first scanner 30 and relayed to the central computer 4 through the first transmitter/receivers 24. The scanned details of the
25 containers are read by block 61. The sub-routine moves to block 62 which requests the crew in the delivery

vehicle to enter the destination of the container which will be written on each container through the key pad 34 on the first scanner 30 for transmission to the central computer 4. Block 62 then reads the

5 destination and the sub-routine moves to block 63 which checks if the destination of the container is the vault 11 or if it is to be set down at a set-down location on the same trip. Should the container be destined for the vault, the computer programme moves to block 64

10 which outputs a message through the first transmitter/receivers 24 to the first infrared scanner 30 which displays a message on the display screen 32 that the container is to be stored in the vehicle for delivery to the vault 11. On the other hand, should

15 block 63 determine that the container is to be set down at a set-down location on the same trip the computer programme moves to block 65 which transmits a message to the first infrared scanner 30 which is displayed on the display screen 32 indicating that the container is

20 to be held in the vehicle for a subsequent set down on the trip. The sub-routine then moves from either block 64 or 65 to block 67 which having counted the number of containers scanned by the first infrared scanner 30 at the pick-up location transmits the recorded number of

25 containers to the first remote unit 7 which is displayed on the screen 32. Block 67 also requests confirmation that the displayed number of containers is

correct. Confirmation is provided by operating an appropriate key on the keypad 34. The computer programme then moves to block 68 which issues a command to the first remote unit 7 for printing a receipt by
5 the first printer 10 for issuing to the customer from which the containers have been picked up.

Referring now to Fig. 5 the sub-routine of the computer programme of the central computer 4 for controlling the set down of containers will now be described. Block 70
10 reads the address of the set-down location at which the delivery vehicle has arrived, which has already been entered through the key pad 34 of the first scanner 30 by the crew. A list of the containers to be set down at a particular address is stored in the first scanner
15 30 since this information is contained in the second schedule which is already stored in the first scanner 30, and a list of the containers to be set down is displayed on the display screen 32. The containers as they are being set down are scanned by the first
20 scanner 30, and the details of the respective containers are transmitted through the first transmitters/receivers 24 to the central computer 4. Block 71 of the sub-routine reads the details of the containers. The sub-routine then moves to block 72
25 which checks that all the containers which were to have been set down at the particular set-down location have

been set down. Should block 72 determine that all containers have not been set down the sub-routine moves to block 73. Block 73 transmits a message setting out details of the missing container or containers via the first transmitters/receivers 24 to the first remote unit 7. Details of the missing container or containers are displayed on the display screen 32 of the first infrared scanner 30. The sub-routine then moves to block 74 which reads details of the remaining containers being set down, and the sub-routine returns to block 72 which again checks that all containers have been set down. Should block 72 determine that all containers have been set down, the sub-routine moves to block 76 which checks that the containers which have been set down are the correct containers. Should block 76 determine that all the containers are not the correct containers, the sub-routine moves to block 78 which transmits details of the containers which are incorrect to the first remote unit 7 which are in turn displayed on the screen 32 of the first infrared scanner 30. The crew on the delivery vehicle make the appropriate corrections. The incorrect containers which are returned to the delivery vehicle are scanned back into the delivery vehicle, and the sub-routine moves to blocks 79 which reads the corrections which have been made. The sub-routine returns to block 76. On block 76 determining that all containers which have

been delivered are the correct containers the sub-routine moves to block 81 which outputs the recorded number of correct containers which have been set down by the delivery vehicle 2, and requests confirmation from the crew that the number is in fact correct. Confirmation is provided by pressing an appropriate key on the keypad 34. The sub-routine then moves to block 82 which issues an instruction to the first remote unit 7 which instructs the first printer 10 to print a delivery docket confirming the delivery of the containers to the customer.

The communication between the central computer 4 and each of the first remote units 7 of the respective delivery vehicles 2 is ongoing throughout the day, and in this way, the memory 15 of the central computer is being continuously updated regarding details of containers and their current location, whether delivered, in the respective delivery vehicles 2 or in the vault 11.

The communication between the central computer 4 and the second remote units 12 and the infrared scanners 37 is substantially similar to the communication between the central computer 4 and the first remote units 7 which has just been described. Accordingly, the computer programme and sub-routines for controlling the

communication between the central computer 4 and the second remote units 12 and the third infrared scanners 37 will be substantially similar to the sub-routines of Figs. 3 to 5 just described.

5 The advantages of the invention are many. A particularly important advantage of the invention is provided by the fact that all containers are scanned into and out of the vehicles and also into and out of the vault. Thus, the progress of the containers is
10 tracked from the time the containers are picked up at a pick-up location until they are set down at a set-down location. Additionally, by virtue of the fact that the exact location of all the containers at all times is known at the central station, the apparatus according
15 to the invention enables the exact location of any container to be determined at any given time. Additionally, the apparatus provides what is effectively a complete automatic control system for controlling the collection and hand over of containers,
20 the contents of which, in general, are of high value. By virtue of the fact that the collection and set down of containers is centrally controlled by the central computer and is continuously being monitored by the central computer, the possibility of errors occurring
25 in either the pick up or set down of containers is virtually eliminated.

A further advantage of the invention is that should an emergency, such as, for example, a hold up occur, the location of the vehicle which is being held up can be readily determined and a current list of the containers
5 on board the vehicle is readily available.

The invention is not limited to the embodiment hereinbefore described which may be varied in construction and detail.

CLAIMS

1. Apparatus for controlling and tracking transfer of a plurality of containers by delivery vehicles from a plurality of pick-up locations to a plurality of set-down locations, the apparatus comprising
- 5 a central controller,
- a plurality of first remote units located in the respective delivery vehicle,
- a first communicating means for communicating the
- 10 central controller with the respective first remote units;
- the central controller comprising
- a first storing means for storing a plurality of addresses of respective pick-up locations and set-down
- 15 locations, details of containers to be picked up and set down and the respective pick-up and set-down locations of the containers, and the times at which pick ups are to be made,
- a first compiling means for preparing from the
- 20 data stored in the first storing means a first schedule of addresses of locations at which containers are to be picked up and/or set down during a predetermined period of time, and the time of pick up,
- a second compiling means for preparing from the
- 25 first schedule a plurality of second schedules of the addresses of the locations at which the containers are to be picked up and/or set down by the respective

delivery vehicles during the predetermined period of time and the respective times of pick up,

a second storing means for storing details of all containers picked up and set down by the respective delivery vehicles,

a first output means for outputting via the first communicating means the second schedules to the respective first remote units of the corresponding delivery vehicles, and

a first receiving means for receiving details from the respective first remote units via the first communicating means details of containers being picked up and set down by the respective delivery vehicles;

each first remote unit comprising

a first reading means for reading details of each container picked up and set down by the corresponding delivery vehicle,

a first output means for outputting to the first receiving means of the central controller via the first communicating means details of containers picked up and set down by the corresponding delivery vehicle from the first reading means,

a first receiving means for receiving data from the first output means of the central controller via the first communicating means,

a display means for displaying data received from the central controller relating to the containers,

a means for confirming to the central controller the correctness of the data received and displayed on the display means,

5 a first printing means for printing a docket in connection with each container received and/or delivered for issuance to a person to who or from who a container has been picked up or set down.

2. Apparatus as claimed in Claim 1 in which provision is made for temporarily holding some of the containers
10 in an intermediate storing location between the respective pick-up and set-down locations of those containers, the apparatus comprising a second remote unit which comprises

15 a second reading means for reading the details of each container transferred into and out of the intermediate storage location,

a second communicating means for communicating the second remote unit with the central controller,

20 a second output means on the second remote unit for outputting data read by the second reading means to the central controller via the second communicating means, and

a second receiving means for receiving data from the central controller via the second communicating
25 means.

3. Apparatus as claimed in Claim 2 in which each second reading means comprises a bar code reader.
4. Apparatus as claimed in Claim 2 or 3 in which the second storing means stores details of containers stored in the intermediate storage location.
5. Apparatus as claimed in any of Claims 2 to 4 in which the first compiling means compiles a third schedule for communicating to the second remote unit, the third schedule comprising details of the containers in the intermediate storage location to be transferred to the respective delivery vehicles for subsequent set down during the predetermined period of time together with details of the delivery vehicle to which each container is to be transferred.
6. Apparatus as claimed in Claim 5 in which each second remote unit comprises a second printing means for printing the third schedule.
7. Apparatus as claimed in any of Claims 2 to 6 in which the first schedule is prepared from data stored in the first and second storing means.
8. Apparatus as claimed in any preceding claim in which each first reading means comprises a bar code

reader.

9. Apparatus as claimed in any preceding claim in which the first and second communicating means are radio communicating means.

5 10. Apparatus as claimed in any preceding claim in which each output means comprises a radio transmitter, and each receiving means comprises a radio receiver.

11. Apparatus as claimed in any preceding claim in which the central controller comprises a central
10 computer.

12. Apparatus as claimed in any preceding claim in which the first and second storing means comprise disc storing means.

13. Apparatus as claimed in any preceding claim in
15 which the first and second compiling means are implemented in the central computer in software.

14. Apparatus as claimed in Claim 13 in which the second compiling means compiles the second schedules from an intermediate schedule which is prepared in a
20 secondary computer from the first schedule, a third communicating means being provided between the central

computer and the secondary computer for communicating the first, the intermediate and the second schedules between the two computers, the intermediate schedule being prepared using a mathematical model for
5 scheduling the delivery vehicles and the addresses of the locations at which pick-ups and set-downs are to be made.

15. Apparatus as claimed in any preceding claim in which the first printing means of each first remote
10 unit is controlled by the first remote unit in response to the central controller.

16. Apparatus as claimed in any preceding claim in which the first printing means comprises a printer.

17. Apparatus for controlling and tracking the
15 transfer of a plurality of containers by delivery vehicles from a plurality of pick-up locations to a plurality of set-down locations, the apparatus being substantially as described herein with reference to and as illustrated in the accompanying drawings.

20 18. A container transferred from a pick-up location to a set-down location and tracked between the pick-up and set-down locations using the apparatus as claimed in any preceding claim.



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Claims searched: 1-18

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Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:
UK CI (Ed.O): G4H (HNP,HNEC,HNEE)
Int CI (Ed.6): H04Q
Other: Online: WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
	None	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.